

PRIME TIME

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The purpose of this publication is to promote the appreciation and enjoyment of prime numbers. Donations toward this non-profit cause are appreciated. Memberships are available. For more information contact the editor at 26 Azzo Road, Eighty Four, PA 15330, (412)222-5879.

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WHAT IS A PRIME NUMBER?

For those of you who may have forgotten, a prime number is a positive integer (whole number) which, when divided by other positive integers, is only evenly divisible by 1 and itself.

For example, the number 17 can be evenly divided by 1 and 17, but not by 2, 3, 4, 5, 6, 7, or 8 (we don't even need to try 9 through 16 because they are too big to divide into 17 and give a quotient of 2 or more). So 17 is a prime!

As another example, consider 21. This number can be divided by 3 and by 7 in addition to 1 and 21. So 21 is not a prime number.

FACTORING INTEGERS INTO A PRODUCT OF PRIMES

An important result in algebra states that every positive integer can be factored into a product of prime numbers. For example, 21 can be written as:

$$21 = 3 \times 7$$

and both 3 and 7 are prime numbers! So when we find an integer which is not a prime, we can still factor it into a product of primes.

WHAT ARE THE PRIME NUMBERS UP TO 50?

I'll do some of these and leave the rest for you!! When the number is not prime, let's factor it into a product of primes.

You may still be wondering how to tell if a number is prime. To start with (we can improve this procedure later), we just try every possible divisor of the integer up to one half of it. If you are lazy, you can do it on your calculator.

Even though the number 1 is only divisible by 1, it is not considered a prime. (Why not? It is the multiplicative identity of the integers, which means that 1 times any integer n gives n : $1 \times n = n$. I know, you're sorry you asked!!)

2 is only divisible by 1 and 2, so 2 is a prime.

3 is only divisible by 1 and 3, so 3 is a prime.

4 is divisible by 1, 2, and 4, so 4 is not a prime: $4 = 2 \times 2$ shows 4 factored into a product of primes.

5 is only divisible by 1 and 5, so 5 is a prime.

6 is divisible by 1, 2, 3, and 6, so 6 is not a prime: $6 = 2 \times 3$

7 is only divisible by 1 and 7, so 7 is a prime.

8 is divisible by 1, 2, 4, and 8, so 8 is not prime: $8 = 2 \times 2 \times 2$ shows 8 written as a product of primes.

9 is divisible by 1, 3, and 9, so 9 is not a prime: $9 = 3 \times 3$

10 is divisible by 1, 2, 5, and 10, so 10 is not prime: $10 = 2 \times 5$

*** You may have noticed by now that once you pass 2, none of the even numbers are prime because they are all divisible by 2!!

11 is prime

12 = $2 \times 2 \times 3$

13 is prime

14 = 2×7

15 = 3×5

16 = $2 \times 2 \times 2 \times 2$

17 is prime

18 = $2 \times 3 \times 3$

19 is prime

20 = $2 \times 2 \times 5$

*** A trick you can use to tell if 3 divides a number is to add the digits of the number; if 3 divides the sum of the digits, it divides the original number, too. For example, consider the number 51. Its digits are 5 and 1, which add to 6. Now 3 divides 6, so the trick tells us that 3 must also divide 51. Actually, $51 = 3 \times 17$.

Well, I will leave 21 through 50 to you. Happy hunting!!
Send your solutions to the editor at the address given above or deliver them in person. Solvers will be recognized in future issues!! MERRY CHRISTMAS!!!